

05', barometer 28.85 (732.8), wind wsw., force 10. On the 14th, the disturbance, having moved slowly eastward, was central near N. 51°, W. 40°; moderate winds prevailed near the centre, while strong westerly gales prevailed over the region to the westward of the fortieth meridian. The s. s. "Alaska," on the 13th and 14th, from N. 48° 14', W. 39° 38', to N. 47° 25', W. 42° 38', encountered very heavy westerly gales, with mountainous seas; during these twenty-four hours, the vessel steamed only one hundred and thirty miles. The s. s. "Nova Scotian," on the 14th, in N. 51° 53', W. 39° 19', reported barometer 28.84 (732.5), wind ene., force 4, showery; and the s. s. "State of Georgia," in N. 51° 01', W. 38° 12', barometer 28.91 (734.3), wind sse., force 1, heavy sw. sea; the s. s. "Bothnia," in N. 48° 21', W. 39° 08', reported barometer 29.17 (740.9), heavy westerly gale, accompanied by hail, rain, and very heavy squalls, heavy westerly sea. On the 15th, the storm-centre was near W. 30°; the pressure had slightly increased and the storm apparently diminished in energy. The s. s. "Elbe," in N. 49° 40', W. 26° 23', reported barometer 29.22 (742.2), wind sw., force 2, cloudy; s. s. "Werra," in N. 50° 12', W. 30° 25', barometer 29.39 (746.5), wind n., force 2-3. During the 15th, the disturbance moved northeastward, and on the 16th, it was central probably near the northwestern coast of Ireland. The s. s. "Ethiopia," in N. 54° 42', W. 13° 59', on the 16th, reported barometer 29.29 (744.0), wind ese., force 4, overcast and rainy, and the s. s. "Baltic," in N. 57° 32', W. 14° 36', barometer 29.33 (745.0), wind nw., force 6.

IV.—This is probably a continuation of the storm traced as low-area vi., chart i. At midnight of the 14th, the depression was central over the Gulf of Saint Lawrence, and during that day strong southeasterly gales prevailed over Newfoundland and to the south of Nova Scotia, and numerous marine disasters were reported. On the 15th, the centre of disturbance was to the eastward of Newfoundland, and probably united with the remains of low-area iii. On the 16th, the depression was central near N. 52°, W. 40°; the s. s. "Werra" in N. 48° 32', W. 39° 00', reported barometer, 29.25 (742.9), wind wsw., force 7-8, cloudy and rainy weather, and the s. s. "Elysia," in N. 47° 28', W. 34° 34', barometer 29.61 (752.1), wind sw., force 5. The depression passed northeastward, being succeeded by strong northwesterly winds and clearing weather in the western quadrants, and on the 17th, it was central near N. 54°, W. 25°; on that date, the s. s. "Nova Scotian," in N. 55° 02', W. 20° 07', reported barometer 29.04 (737.6), wind sse., force 3, cloudy. The s. s. "Ohio," in N. 51° 09', W. 20° 30', reported barometer 29.13 (739.9), wind w., force 5, fair; while vessels to the eastward of the twentieth meridian encountered strong southerly gales. On the 18th, the depression was off the Irish coast, accompanied by moderated easterly and northeasterly gales in the region north and east of the centre, while brisk northerly and northwesterly winds prevailed in the rear of the depression. From the 20th, to the close of the month, a large and deep depression covered the north Atlantic ocean from Newfoundland eastward to the British Isles. In this extended area, the atmospheric pressure ranged from 28.50 (723.9) to 29.80 (756.9), and from the circulation of winds, it would appear that two or more independent storm-centres were enclosed within its limits; the data on hand at this moment, however, are too meagre to admit of a tracing of the paths of these storms. It is worthy of note, that, notwithstanding the depth of the atmospheric depression, extremely violent winds do not appear to have been general, many vessels reporting light to moderate winds. The following reports serve to indicate the weather conditions over the north Atlantic during the last decade of the month: Captain Molsen of the s. s. "Heckla," reported: "From the 20th, to 26th, between N. 56° 30', W. 25° 10', and N. 45° 30', W. 53° 00', barometer oscillating irregularly between 29.47 (748.5) and 30.20 (767.0); wind very unsteady in direction and force; weather threatening with clearing at intervals." Captain Hamilton Perry, of the s. s. "Britannic," reported: "December 23d, in N. 51° 21', W. 14° 22', light westerly breeze with heavy rain, barometer 29.98 (761.5) moderate sea from wsw.,

barometer falling slowly but steadily until 4 a. m., of the 26th, (about N. 49° 24', W. 38° 15'), when it read 28.85 (732.8). During this interval, the wind had been variable in direction, and from strong to gentle breeze with heavy swell from the sw. After the 26th, the barometer rose steadily, the wind veered to ne. and n., with heavy squalls and showers of rain, and with heavy northeasterly swell. At no time did we have the wind to warrant such a low glass."

Captain J. T. Rogers, of the s. s. "Lepanto," reported: "December 20th, 2.30 p. m. (near N. 44°, W. 37°), strong southerly gale with hard squalls of rain; dull cloudy weather and high mountainous sea; moderating at midnight of 20th. 21st, moderate southeasterly gale, much rain and very heavy swell from south; weather at times clearing, and then heavy squalls of rain would appear on the horizon. This fitful weather continued until the morning of the 22d; at 8.40 a. m., Greenwich mean time, it became overcast, the wind increased and lulled until 9.40 a. m., when it blew a hurricane, accompanied by heavy rain. At 4.00 a. m., the barometer read 29.76 (755.9), and at 8.40 a. m., it stood at 29.07 (738.4); the hurricane lasted two hours, and then decreased to a very strong gale. On the 25th, at 8.00 a. m. (N. 42°, W. 54°), had a strong northwesterly gale and high sea; terrific squalls of wind and rain till noon of the 26th, when it moderated."

Captain W. C. Gardner, of the bark "Champion," reports: "23d, 3.30 p. m., Greenwich mean time, N. 32° 05', W. 74° 07', with lowering overcast sky, it began to rain heavily, accompanied by thunder and lightning, wind falling light. The electrical disturbance continued until 6.30 p. m., when it ceased, the rain continuing (but lighter) until 10.00 p. m., wind, light airs."

Captain Brooks, of the s. s. "Arizona," reports: "26th, (N. 51° 07', W. 27° 29'), at 5.50 p. m., Greenwich mean time, the barometer fell to 28.70 (729.0), wind wsw., force 10 to 12, with constant rain; the barometer then rose slowly, and the wind gradually decreased. This gale ended at wsw. We nearly always find gales of this nature shifting suddenly to the northward."

Captain H. C. Williams, of the s. s. "Brooklyn," reports: "25th, at 21h. 29m. (near N. 52°, W. 33°), lowest reading of the barometer 28.50 (723.9); depression evidently very extensive, and the gradient of a moderate inclination, as it passed without any atmospheric disturbance corresponding with the low state of the barometer."

Captain E. E. Wilson, of the s. s. "Salerno," reported: "From 29th to 31st, between N. 49°, W. 17°, and N. 49°, W. 27°, barometer rising gradually until 8.00 p. m. of the 29th, when it fell to 29.10 (739.1), wind backed to southeast, blowing strongly, with fine clear weather and heavy cross-sea, which continued until 4.00 a. m. of the 30th. The wind then shifted to westerly, and continued to blow hard; weather clear. At 6.00 a. m. of the 31st, the barometer again fell to 29.27 (743.4), weather cloudy with rain, fresh breeze from e., sw., w., and nw."

INTERNATIONAL METEOROLOGY.

International charts iv. and v. accompany the present number of this REVIEW. Chart iv. is published for October, 1880, and continues the series begun in January, 1877. Chart v. is prepared for January, 1881, and continues the series begun in November, 1877. For the description of these charts, much valuable information has been obtained from the "Monatliche Uebersicht der Witterung," published by Professor Dr. G. Neumayer, Director of the German Marine Observatory at Hamburg, and from the "Bulletin Mensuel," published by Mr. Marc Dechreves, of Zi-Ka-Wei, China.

Chart iv. exhibits the mean pressure, mean temperature, and the prevailing directions of the wind over the northern hemisphere, and at certain isolated stations in the southern hemisphere, as determined from one observation taken each day at 7.35 a. m. Washington, or 0.43 p. m. Greenwich mean time.

The region of lowest mean pressure, indicated by the isobar of 29.60 (751.8), occupied that part of European Russia lying

north of the sixtieth parallel of latitude, and between the meridians of 30° and 50° east longitude. Within this area, the lowest mean pressure reported was 29.52 (749.8) at Archangel. South of 60° N., the barometric gradient gradually increases until the isobar of 30.00 (762.0) occupies southern Russia and central Asia.

The isobarometric lines of 29.70 (754.4) and 29.80 (756.9) cover central and western Russia, the Scandinavian peninsula, and western Siberia, while that of 29.90 (759.4) occupies the countries of central and western Europe.

In the North American continent, the area of barometric minima occupies the region near Hudson's Bay; here the lowest mean pressure reported, 29.89 (759.2), was at York Factory, British America.

In the eastern hemisphere, the area of highest mean pressures occupies southeastern Siberia and China; and the isobar of 30.10 (764.5) covers the central and southern parts of Algeria and Tunis, where the mean pressure ranges from 30.10 (764.5) to 30.16 (766.1).

In the United States, the area of highest mean pressures covers the north Pacific coast region, where the mean pressure ranges from 30.15 (765.8), at Olympia, Washington Territory, to 30.33 (770.4) at Umatilla, Oregon. The isobarometric line of 30.10 (764.5) occupies Texas, the Southern and middle states, and extends to the southern part of the New England states.

Compared with the preceding month, (September, 1880,) there has been a general increase of pressure over the United States; the increase is most marked in the north Pacific coast region. The isobar of 30.10 (764.5), which, in September, occupied the Southern states, has extended northeastward to the forty-fifth parallel.

In Canada, the mean pressure has increased in all parts of the Dominion, the increase being greatest over the Maritime Provinces.

In Europe, the mean atmospheric pressure has everywhere decreased, the decrease being greatest in northern Russia, where it amounted to .50 inch. In the northern part of Scotland and in Ireland, there has been a slight increase in pressure.

In Greenland, the pressure has greatly increased, the mean at Godthaab being 30.07 (763.8), or .25 inch above that of the preceding month.

In Algeria and Tunis, a very slight increase has occurred in the mean pressure.

In Asia, the pressure has increased over Hindostan and over the eastern part of the continent.

Compared with the corresponding month of previous years, the mean atmospheric pressure is slightly above the normal in all parts of the United States. In Washington Territory, it is about .07 inch above the normal.

In Canada, the mean pressure generally is above the average.

The following table shows the mean pressure and the mean temperature, with corresponding departures, for the month of October, 1880, in the several countries of Europe and Asia, compared with the means as determined from observations taken during the years 1877, 1878, and 1879:

Countries.	Mean Pressure.			Mean Temperature.		
	Oct., 1877, 1878, and 1879	Oct., 1880.	Depart- ure.	Oct., 1877, 1878, and 1879.	Oct., 1880.	Depart- ure.
Algeria.....	30.07	30.11	+0.04	69.3	75.8	+6.5
Austria.....	30.02	29.92	-0.10	58.3	56.8	-1.5
British Isles.....	29.91	29.90	-0.01	53.7	50.1	-3.6
Denmark.....	29.57	29.78	+0.09	50.7	46.1	-4.6
France.....	30.02	29.08	-0.09	64.6	64.3	-0.3
Germany.....	30.00	29.85	-0.15	52.5	50.1	-2.4
India.....	29.84	29.86	+0.02	80.6	80.8	+0.2
Italy.....	30.02	29.97	-0.05	65.4	66.9	+1.5
Norway.....	29.72	29.74	+0.02	46.7	40.4	-6.3
Portugal.....	30.07	30.00	-0.07	67.7	67.9	+0.2
Russia.....	30.01	29.81	-0.20	51.4	46.5	-4.9
Spain.....	30.00*	29.87	-0.08	67.7*	68.2	+0.5
Sweden.....	29.76	29.66	-0.10	44.1	35.2	-8.9

* Mean for two years only.

The accompanying table shows the deviations in pressure and temperature at isolated stations during the month of October, 1880, as compared with the means of three years:

Comparative Thermometric and Barometric Means, with corresponding Departures.

STATION.	Mean Pressure.			Mean Temperature.		
	Oct., 1877-78-79.	Oct. 1880.	Departure.	Oct., 1877-78-79.	Oct., 1880.	Departure.
San José, Costa Rica, C. A.....	30.03	30.06	+0.03	67.5	66.9	-0.6
Jibraltar.....	30.00	29.99	-0.01	69.9	69.6	-0.3
Malta, Mediterranean Sea.....	29.77	29.96	+0.19	73.2	74.6	+1.4
Sandwick Manse, Orkney Islands.....	29.92	29.96	+0.04	49.1	44.6	-4.5
Bridgetown, Barbadoes.....	30.04	30.09	+0.05	82.9	80.8	-2.1
Cape Town, Cape Good Hope.....	29.86	29.91	+0.05	65.0	80.2	+12.2
Fort Napier, Natal, South Africa.....	29.93	29.89	-0.04	72.2	70.5	-1.7
Freetown, Sierra Leone.....	30.10	30.15	+0.05	84.0	84.0	normal
Mauritius, Indian Ocean.....	29.99	30.00	+0.01	74.9	75.0	+0.1
Melbourne, New South Wales.....	29.99	30.00	+0.01	54.6	55.8	+1.2
Nassau, Bahamas.....	29.68	30.07	+0.39	80.0	79.4	-0.6
Godthaab, Greenland.....	29.64	30.17	+0.53	29.9	37.2	+7.3
Stykkisholm, Iceland.....	29.60	30.01	+0.41	39.4	37.4	-2.0
Thorshavn, Faroe Islands.....	29.80	30.11	+0.31	46.0	41.0	-5.0
Fort-de-France, Martinique.....	30.18	30.15	-0.03	80.3	77.0	-3.3
Zi-Ka-Wei, China.....	30.03	30.01	-0.02	68.8	61.9	-6.9
Athens, Greece.....	29.83	29.93	+0.10	71.2	74.5	+3.3
Lahore, British India.....	29.98	29.96	-0.02	81.8	82.9	+1.1
Cagliari, Sardinia, Italy.....	30.06	30.07	+0.01	70.5	73.9	+3.4
Tokel, Japan.....	29.58	29.61	+0.03	57.3	59.1	+1.8
Tromsø, Norway.....	30.11	29.83	-0.28	37.3	31.3	-6.0
Azores, Azores.....	30.10	30.05	-0.05	66.9	66.6	-0.3
Funchal, Madeira Islands.....	30.13	29.83	-0.30	73.3	73.6	+0.3
Ponta Delgado, Azores.....	29.76	29.62	-0.14	70.2	68.4	-1.8
Archangel, Russia.....	30.11	30.02	-0.09	39.4	38.3	-1.1
Tiflis, Russia.....	30.18	30.01	-0.17	65.8	71.1	+5.3
Asrakhan, Russia.....	30.08	29.73	-0.35	58.0	59.2	+1.2
Ekatereburg, Russia.....	30.19	30.08	-0.11	41.4	32.7	-8.7
Nukus, Toorkistan, Asia.....	30.27	30.13	-0.14	58.2	66.6	+8.4
Tashkend, Toorkistan, Asia.....	30.32	30.05	-0.27	64.3	55.9	-8.4
Barnaul, Siberia, Asia.....	30.18	30.13	-0.05	39.3	40.6	+1.3
Pekin, China.....	30.18	30.13	-0.05	51.6	55.2	+3.6
Nikolaievsk on the Amoor, Asia.....	29.93	30.00	+0.07	33.9	29.5	-4.4
San Juan de Puerto Rico, W. I.....	29.93	29.98	+0.05	81.5	81.9	+0.4
Mexico, Mexico.....	30.16	30.45	+0.29	79.7	78.6	-1.1
Beirut, Turkey in Asia.....	29.83	30.07	+0.24	54.3	50.9	-3.4
Havana, Cuba, W. I.....	29.99	30.00	+0.01	79.2	78.3	-0.9
Paramaribo, D. Guiana, S. A.....	29.98	29.89	-0.09	81.2	81.4	+0.2
York Factory, B. A.....	29.98	29.89	-0.09	23.4	21.3	-2.1

* Mean for two years only.

In the United States, the mean temperature of the air was about normal in the region lying east of the Mississippi river, and south of the forty-first parallel of latitude. Between the Mississippi river and the Rocky mountains, the mean temperature was generally below the normal, the departures ranging from 1° to 4°.

In Canada, the mean temperature was about normal in the Saint Lawrence valley and in the Maritime Provinces; elsewhere it was about 2° below the average.

In Europe, the mean temperature of the air was below the normal in the British Isles, central Europe, the Scandinavian peninsula, and in northern and central Russia. In the southern part of Europe, the temperature was about normal. Referring to the unusually low mean temperature of the month, Mr. James Glaisher, F. R. S., in the "Quarterly Journal of the Meteorological Society," for the quarter ending December, 31, 1880, states that the mean temperature of the air, for October, in England, was below the average of the preceding one hundred and nine years. During that period there were but seven instances of a mean temperature so low for October; viz.: in the years 1778, 1782, 1784, 1786, 1808, 1817, and 1842.

In British India, the temperature was about normal; the highest mean 85° Fahr. (29° Cent.) was reported at Kurrachee; and the lowest, 73° Fahr. (23° Cent.) at Belgaum.

The following are some of the extreme monthly mean temperatures reported at isolated stations:

HIGHEST.	Degrees.	LOWEST.	Degrees.
Freetown, Africa.....	84.0	York Factory, British America.....	21.3
San Juan de Puerto Rico, W. I.....	81.9	Nertchinsk, Siberia.....	21.6
Saint Thomas, West Indies.....	81.8	Yeniseisk, northwestern Siberia.....	24.3
Manila, Luzon, Philippine Isl's.....	81.5	Nikolaievsk, on the Amoor, Asia.....	29.5
		Tromsø, Norway.....	31.3

In the United States, the prevailing direction of the wind was northeasterly in Florida, and in that part of the country lying east of the ninetieth meridian, and between 30° and 40° north latitude. North of the fortieth parallel, the prevailing directions were southerly and northwesterly. On the north

Pacific coast, the prevailing wind was northerly, and in southern California they were southeasterly and southwesterly.

In Canada, the prevailing wind was southwesterly.

In Europe, the winds were as follows: Northerly and northeasterly in Scandinavia and the British Isles; westerly in Denmark; in central and western Europe, mostly westerly and southwesterly. In Russia, the prevailing winds were, southerly in the Crimea, westerly and southerly in central Russia, and easterly in the northern part of the country.

In Japan, the winds were mostly northerly. At Zi-Ka Wei, China, it was easterly.

Over the north Atlantic ocean, the prevailing winds were: northerly and northwesterly, east of 70° west longitude; between W. 50° and W. 30°, and north of the fortieth parallel, they were generally northeasterly; and east of W. 30°, they were easterly and northeasterly.

The rainfall of the month was above the average in the United States, east of the Mississippi river, and south of N. 45°. Between the ninety-eighth meridian and the Mississippi river, it was slightly below the average; and on the Pacific coast, it was also under the average.

In Canada, the rainfall was above the average, except in the Maritime Provinces, where it was much below the average.

In Europe, the rainfall was everywhere considerably in excess of the average. The month is reported to have been one of the wettest Octobers on record; the rainfall in many places being exceptionally heavy. In central and western Europe, the rainfall was more than double the average amount.

Chart v. exhibits the paths of barometric minima for the month of January, 1881, which have been traced from the daily international charts.

The data are charted for each day of the month, on the maps accompanying each issue of the "International Bulletin," and from these charts, and from additional reports are traced the movements of the centres of barometric minima. Thirty-two of the more important depressions that have appeared over the northern hemisphere have thus been traced. The following concerns the general distribution of these depressions:

Eleven appeared in the United States and Canada; three of these were first observed on the Pacific coast, and three apparently developed south of the thirtieth parallel of latitude. Three depressions are traced from the North American continent eastward over the Atlantic; of these, the storm traced as low-area i., was remarkable for the persistency with which it remained over the ocean, the large area under its influence, and the severe gales that accompanied it during the first half of the month.

Fourteen depressions are shown over Europe, and are distributed as follows: Five appeared in the extreme northern part of the continent; the course of those depressions, though somewhat erratic, was, in general, from northwest to southeast. Three depressions traversed central Europe, the most noteworthy being that charted as low-area xxi. It was accompanied by violent snow in England, France, and Germany, and is reported to have been the most severe storm experienced in England during a period of more than fifty years. Two depressions passed northeastward to the north and west of the British Isles, while four appeared in southern Europe, and moved from west to east or northeast.

Six areas of low barometer are exhibited over eastern Asia; these prevailed mostly over Japan, where the barometer was relatively low throughout the month.

The following are brief descriptions of the storms that appeared in the United States and Canada:

I.—This depression developed in the Gulf of Mexico during the night of December 31st. On the morning of January 1st, it was central west of Punta Rassa, Florida, and was attended by light snow in southern Alabama and in northwestern Florida. The centre of disturbance moved across Florida during the 1st, and was accompanied by heavy rains in the peninsula, while heavy northeasterly gales prevailed along the Atlantic coast south of North Carolina. On the 2d, the disturbance

was central, with increased energy, near N. 37°, W. 70°, the schooner "Estelle," in N. 37° 24', W. 74° 37', reporting hurricane-like winds veering to nw., and lasting four hours; vessel lost mainmast, stove bulwarks, and sustained other damage. On the 3d, the storm-centre was near the Banks of Newfoundland; the s. s. "Ohio," in N. 44° 58', W. 51° 55', reported barometer 29.81 (757.2), calm, weather cloudy; vessels west of the centre of disturbance encountered strong n. and nnw. gales. On the 4th, the disturbance moved northeastward, and was central near N. 48°, W. 42°, the pressure decreasing as the centre moved slowly eastward, and strong se. to n. gales prevailed. On the 5th, the area of lowest pressure, indicated by the isobar of 28.80, (731.5), occupied the ocean near N. 47°, W. 37°; the s. s. "Ohio," in N. 48° 48', W. 40° 09', reported barometer 28.65 (727.2), wind e., force 7, heavy rain; and the bark "Siddartha," in N. 47° 12', W. 34° 52', had a severe se. gale, with very dangerous sea, barometer 28.00 (711.2). During the 6th, the disturbance remained nearly stationary, but the region of least pressure was farther to the westward than on the previous day; the s. s. "Ethiopia," in N. 47° 19', W. 43° 41', reported barometer 28.98 (736.1), wind w., force 7, squally; s. s. "Ohio," in N. 50° 13', W. 36° 49', barometer 29.01 (736.8), wind se., force 7, heavy rain. On the 7th, the centre moved slowly eastward and was shown near N. 48°, W. 38°. The following vessel reports indicate its position: s. s. "Britannic," in N. 45° 59', W. 37° 33', barometer 29.06 (738.1), wind sse., force 5, raining; s. s. "Ethiopia," in N. 48° 42', W. 38° 01', barometer 29.07 (738.4), wind e., force 4, cloudy. The s. s. "Ohio," which had apparently moved eastward near to and with the storm-centre, from the 3d to the 6th, appears to have passed beyond it on 7th, as, in N. 50° 51', W. 32° 19', she reported barometer 29.49 (749.0), wind se., force 6, cloudy. On the 8th, the area of least pressure extended from the Banks of Newfoundland southeastward to the Azores. Strong westerly and northwesterly gales prevailed at the western limits of this area, and at its northeastern edge, the winds were easterly and southeasterly, varying from fresh to strong gales, with high southwesterly sea. On the 9th, the storm-centre was probably near N. 45°, W. 35°; the s. s. "Celtic," in N. 48° 29', W. 40° 30', reported barometer 28.84 (732.5), wind ne., force 2, cloudy. The bark "Wm. Gordon," in N. 50° 00', W. 28° 40', had strong se. gale, with high sea, and the s. s. "Oder," in N. 51°, W. 26°, strong sse. gale, high sea and cloudy weather. During the 9th and 10th, the area of the disturbance greatly increased in dimensions and the region of decreasing pressure included Portugal and the western part of Spain within its limits. On the 10th and 11th, the storm-centre was in the vicinity of the Azores, the lowest reported pressure being at Angra, on the 10th, when the barometer read 28.91 (734.3), wind west, 19 miles an hour; and rainy or cloudy weather prevailed at stations in Spain and Portugal. By the morning of the 12th, the shifting of the winds at stations in the Azores indicated that the centre of disturbance had moved to south of those islands. The bark "Coppername," in N. 34° 30', W. 22° 06', reported barometer 29.48 (748.8), being a fall of .08 inch, wind changing from sw., force 5, to ssw., force 7. On the morning of the 13th, the storm-centre occupied nearly the same position as on the previous day, but a slight easterly movement appears to have set in during the day, as, on the 14th, the depression presented the form of an extended trough, and the region of least pressure was transferred to northwestern Spain. This disturbance is hereafter described as low area xix. of the chart.

II.—This depression probably developed in the Saskatchewan valley on the last day of the preceding month; it moved southeastward, and on the morning of the 1st, was central in Dakota. The disturbance then moved by an east-northeasterly course toward the lake region, and on the morning of the 2d, the centre was in Ontario, Canada. On the 3d, the depression, having moved down the valley of the Saint Lawrence, was central near the mouth of the Saint Lawrence river, and strong westerly winds occurred at stations

in the Canadian Maritime Provinces. During the passage of the disturbance, a slight rise in temperature occurred in the lake region and in the Saint Lawrence valley; this was immediately followed by a decided fall, the thermometer at many places in northern Ontario, and in the province of Quebec, registering twenty degrees below zero. The disturbance probably moved southeastward during the 3d, and became merged in low-area i., then central near the Banks of Newfoundland.

III.—This depression developed in the Gulf of Mexico, and was central south of Galveston on the morning of the 3d. The disturbance moved northeastward, attended by heavy rain, and was central in southern Mississippi on the 4th; the pressure gradually decreased as the centre moved northeastward, and rain or snow fell in all districts east of the Mississippi river. By the morning of the 6th, the depression was in the lake region, the barometer near the centre reading 29.52 (749.8), at Buffalo, New York. During the 6th and 7th, the disturbance moved northeastward over the Canadian Maritime Provinces and the Gulf of Saint Lawrence, and probably merged in the large depression, low area i., which occupied the north Atlantic ocean on the 7th.

IV.—This storm developed in Manitoba, British America, on the 4th; it moved southward, causing rain and snow in Dakota, Montana, and Nebraska. On the 5th, the storm-centre was in Nebraska; Omaha barometer 29.52 (749.8), and on the 6th, the depression apparently filled up in northern Texas.

V.—From the 4th to the 7th, an area of low-pressure occupied the region near Hudson's bay. On the latter date it was succeeded by an area of high barometer, which prevailed until the 12th.

VI.—This disturbance developed over the western part of the Gulf of Mexico, and on the morning of the 9th, was central south of Galveston. Strong northerly and northeasterly gales were reported at stations on the Texas coast, and heavy rains occurred in Florida and in the states adjoining the Gulf of Mexico. The depression passed rapidly northeastward through Georgia, the Carolinas, and Virginia, and on the 10th, it was off the coast of New Jersey. Severe northerly and northeasterly gales, and heavy rain occurred at stations near the track of the centre, and were followed by strong northwesterly winds and heavy snow, from Texas northeastward to the New England states. On the 11th, the centre of disturbance was south of Nova Scotia, the s. s. "Wyoming," in N. 41°, W. 67°, reporting fresh s. to nw. gale, with rain. During the 12th and 13th, the depression moved eastward and united with low-area i. which, on the last-mentioned date, extended from the Azores to the Banks of Newfoundland.

VII.—This depression, probably an offshoot of low-area viii., appeared in Montana on the 11th, and was attended by heavy snow in that territory and in Idaho. By a course slightly south of east, the disturbance moved to Missouri, where it was central on the morning of the 12th. On the 13th, the depression extended from Texas northeastward to Ontario, Canada, the region of least pressure being in Michigan. During the 13th, the disturbance moved in an east-northeasterly direction across lakes Huron and Ontario, and, on the 14th, entered the province of Quebec, causing rain and snow along the Saint Lawrence valley. The course then became southeasterly, and the disturbance moved over the Maritime Provinces; on the 15th, the centre was east of Nova Scotia, the pressure gradually increasing. On the 16th, the depression disappeared near Newfoundland. During the existence of this depression, the temperature fluctuations were very rapid and marked; an area of high-pressure followed in the immediate rear of the disturbance, and strong northwesterly gales and low temperatures occurred at all stations after the passage of the centre.

VIII.—This depression appeared off the coast of Washington Territory on the 11th. By the 12th, the disturbance had moved to the east of the coast-line, and, on the 13th, finally disappeared in British America. During the existence of this depression, cloudy and rainy weather prevailed generally in the north Pacific coast region.

IX.—This disturbance appeared on the 14th as a well-defined area of low barometer in northern California. It apparently moved southeastward, and, on the morning of the 15th, the region of least pressure was in Kansas. Cloudy weather and light snow prevailed at stations in the eastern quadrants, and light rains fell in southern California. The depression moved slowly southeastward with decreasing pressure, and, on the morning of the 16th, it was shown in eastern Texas; during the day, it moved southward, and, on the 17th, was apparently central near the western shores of the Gulf of Mexico. The course then changed to northeast, and the depression moved slowly over the Gulf. On the 19th, the storm-centre was south of New Orleans, Louisiana, attended by heavy rain, which extended to all the Southern states as the centre of disturbance moved northeastward. On the 20th, the storm-centre was in Tennessee, the barometer at Memphis reading 29.75 (755.6), wind nw., light rain. During the 20th, the movement appears to have been more rapid than on the preceding days, and on the 21st, the storm-centre was in Pennsylvania. The barometric gradient had rapidly increased in the northeastern quadrants of the storm, and violent northeasterly and east-southeasterly gales prevailed in the districts lying north and east of the centre. On the 22d, the disturbance passed off the New England coast into the Atlantic, causing snow in the Canadian Maritime Provinces. On the 23d, the storm-centre was to the eastward of Newfoundland, the s. s. "Vaderland," in N. 49°, W. 46°, reporting strong sse. to wnw. gale, with snow squalls. During the 23d, the disturbance moved by a northeasterly course to about N. 50°, W. 40°, where it was central on the morning of the 24th; the s. s. "Ohio," in N. 45° 07', W. 40° 38', reported barometer 28.93 (734.8), wind w., force 4, cloudy, and the s. s. "Donau," in N. 50°, W. 35°, encountered a heavy sse. gale. The storm-centre then moved slowly eastward, or slightly to the south of east, and, on the 25th, it was near N. 47°, W. 33°; on that date, the s. s. "Rhyndland," in N. 48° 10', W. 31° 45', reported barometer 28.54 (724.9), wind e., force 8, weather threatening; in N. 50° 38', W. 38° 55', the s. s. "Ethiopia" reported barometer 28.97 (735.8), wind w., force 3, raining, and the s. s. "Celtic," in N. 46° 06', W. 39° 15', barometer 29.01 (736.8), wind nne., force 5, weather fair. On the 26th, the path of the storm-centre again changed to the northeastward, but the centre of disturbance apparently moved very slowly, and was then near N. 49°, W. 29°; the s. s. "Celtic," in N. 48° 12', W. 32° 00', reported barometer 28.37 (720.6), wind n., force 5, cloudy, heavy easterly sea; the s. s. "Hermann," in N. 47° 51', W. 29° 43', barometer 28.52 (724.4), wind sw., force 6, clearing weather; the s. s. "Rhyndland," in N. 48° 57', W. 27° 07', barometer 28.43 (722.1), wind w., force 5, cloudy. On the 26th, the low-area became elongated, the region of barometric minima occupying nearly the same position as on the 26th; during the 27th, the centre began to move eastward, and by the morning of the 28th, it was off the southwest coast of Ireland. The subsequent course of this disturbance is hereafter described under low-area xxvi.

X.—This disturbance first appeared in the Pacific, on the 25th, and was then apparently central off the coast of Washington Territory. During the 26th and 27th, the depression moved slowly southward along the coast, and entered Oregon on the 28th, causing heavy rains in California and Washington Territory; much damage resulted from floods in the sections above-mentioned. During the 28th the disturbance moved rapidly eastward, crossed the Rocky mountains, and, on the 29th, appeared in Nebraska. It continued its easterly movement with gradually increasing pressure at the centre, and finally disappeared in the lake region.

Xa.—This depression probably developed over the ocean between the coast of the United States and the Bermudas. On the 26th, the bark "St. Anna," in N. 35° 35', W. 68° 53', encountered a hurricane from sw. to se., which lasted until the 27th; on the 28th, the brig "Margrethe," in N. 37°, W. 68°, had a heavy gale from w. and nw., with high sea and heavy

rain; the gale continued, with more or less violence, until February 1st. On the 29th, the centre of disturbance was apparently near N. 40°, W. 55°; on that day, the s. s. "Nova Scotian," in N. 40° 41', W. 55° 09', reported barometer 29.36 (745.7), wind variable, force 1, sleeting, while strong nw. gales, with snow, prevailed in the western quadrants of the depression. On the 30th, the storm-centre was between 40° and 50° north latitude, and probably near the forty-fifth meridian; the s. s. "Nova Scotian," in N. 42° 02', W. 51° 32', reported barometer 29.28 (743.7), wind nnw., force 3. On the 31st, this disturbance probably merged in a large depression which occupied the ocean, the region of lowest pressure then lying off the British Isles.

XI.—This depression appeared in Texas on the 30th; it moved northeastward and, at the close of the month, was central in eastern Missouri. During its passage, rain fell at stations north and east of the centre.

XII.—This depression appeared on the 1st, west of Upernavik, Greenland; it moved in a southeasterly direction and, on the 2d, was central in southern Greenland. During the 3d and 4th, the centre apparently remained near the southern extremity of Greenland, and, on the 5th, the disturbance probably united with low-area i.

The following descriptions relate to the storms that occurred in Europe during the month:

XIII.—This disturbance was central off northern Norway on the 2d. It moved by a southeasterly course over Finland, and on the 4th was central over the White sea. The depression continued its eastward movement during the 5th, and on the 6th, it entered western Siberia, accompanied by a slight rise in temperature. On the 7th, the disturbance had passed beyond the stations of observation.

XIV.—This storm first developed near the coast of Algeria on the 3d. It moved northeastward over the Mediterranean, and, on the 4th, was central near Majorca, Balearic Isles, attended by cloudy weather and rain in the northern quadrants. On the 5th, the disturbance was central, with slightly decreased pressure, between Italy and the island of Corsica; on that day, the area of disturbance increased and the barometric fall extended over central Europe, accompanied by a rise in temperature and general rains in that region. On the 6th, the path of the centre of disturbance changed slightly and the lowest barometric readings were shown over central Italy. On the 7th, the pressure decreased in southern Italy, and the circulation of the winds indicated the presence of the centre near the entrance to the Adriatic sea. On the morning of the 8th, the area of lowest readings was inclosed by the isobars of 29.80 (756.9) and on the 9th, the disturbance, moving over Greece, disappeared near the Black sea.

XV.—This depression, enclosed by the isobar of 29.00 (736.6), appeared off the northwestern coast of Norway on the 6th. It moved southeastward during the 7th and 8th, causing stormy westerly and northwesterly winds in the Scandinavian peninsula and in northwestern Russia. During the 8th, the disturbance moved eastward and disappeared near the Ural mountains.

XVI.—This depression appeared in Scandinavia on the 9th, and caused a slight decrease of pressure over Scotland. Owing to the presence of an area of high-pressure which occupied the North sea and the British Isles, very steep gradients were formed, and strong westerly and northwesterly winds occurred at stations in Sweden and Norway. On the 10th, the centre of disturbance was in the Baltic provinces of Russia, the pressure having decreased as the disturbance moved southeastward; Dorpat, barometer 29.03 (737.3), wind nnw., force 7, snowing. During the 10th and 11th, the course changed to northeasterly, and on the 12th, the disturbance appeared near Archangel, Russia. The pressure increased as the centre moved northeastward, and the temperature fell more than ten degrees in northern Russia. On the 13th, the area of least pressure was over northern Scandinavia and northern Finland, whence it moved southward, and on the 14th, was near the northern part of the

Gulf of Bothnia. The remains of this depression probably united, on the 15th, with low-area xx.

XVII.—This disturbance appeared on the 11th in the Mediterranean. It caused a slight but general decrease of pressure over central and western Europe, and rain fell at stations in southern France. The depression moved eastward, and on the 12th, was in northern Italy. On the 13th, the centre was near the southwestern coast of Austro-Hungary, where it was probably re-inforced by low-area xviii., which had advanced southeastward through central Europe. On the 14th, the region of low-pressure was transferred to the Black sea, and was accompanied by strong southwesterly breezes and snow, with slightly higher temperature. During the 14th, the disturbance moved in a north-northeasterly direction, and, on the 15th, was central, with decreased pressure, near Moscow, Russia. Strong westerly winds occurred at stations south of the centre, and strong northeasterly winds prevailed in the northern quadrants. On the morning of the 16th, the depression was central near Archangel, barometer 28.93 (734.8), wind nne., snowing; during the day, the disturbance disappeared in the Arctic ocean.

XVIII.—This depression developed over the North sea on the 11th, and on the 12th, it appeared as a well-defined low-area, with its centre near the eastern coast of England. It moved southeastward and entered the continent during the 12th; snow fell generally at stations in central Europe, and a slight rise in temperature occurred. On the 13th, the storm-centre was in southern Germany, and during the day, the disturbance probably united with low-area xvii.

XIX.—This is a continuation of the storm traced as low-area i. of the present chart. On the 14th, the depression presented the form of an elongated ellipse, with its eastern limit in the Iberian peninsula. Rain and snow occurred at stations along the southern shores of the Bay of Biscay, and cloudy weather, or rain, was general at stations east of the centre. On the 15th, the area of low barometer, 29.60 (751.8), extended from Spain to the western shores of the Black sea, the lowest readings being over Italy. On that day, the pressure remained relatively low over central Europe, and a remarkable fall of temperature occurred in Germany. At Munster, province of Westphalia, and at Leipsic, Saxony, the temperature fell to -13° Fahr. (-25° Cent.), and in all parts of Germany and Austria, the fall was more or less marked. On the 16th, the depression moved to the Adriatic sea, and a general increase of pressure set in over central Europe and over Spain. On the 17th, the lowest pressure was transferred to the Crimea; during the passage of the centre, rain or snow fell at stations near its path, and strong northerly winds prevailed over the Black sea. During the 17th, the storm-centre moved northeastward, causing strong westerly gales at stations on the western shores of the Caspian sea, and on the 18th, the disturbance disappeared in western Siberia.

XX.—This depression appeared in southern Sweden on the 15th, and was attended by a rise in temperature over the Scandinavian peninsula, Scotland, and at stations on the shores of the Baltic. The disturbance moved into Russia on the 16th, and probably united, during the day, with low-area xvii. then central near Moscow.

XXI.—In western Europe, this was the most noteworthy storm of the month, on account of the violent and prolonged snow-storm that occurred during its passage. After the passage of low-area i., the barometer remained low over the Azores, but, on the 16th, a further decrease of pressure occurred, and an independent area of low barometer was formed over these islands. The disturbance moved northeastward and, on the 17th, was central near the southern part of the Bay of Biscay. Rain and snow fell at stations in Spain and Portugal, and in western France, and a decided rise in temperature occurred in those districts, and included also the southern part of England. On the 18th, the storm-centre was in the English Channel; violent easterly gales prevailed over the North sea, and at nearly all stations in the British Isles, while strong

westerly gales occurred in the Bay of Biscay and in western France. On the 18th, an unusually heavy fall of snow occurred in England and in the northern half of France. In the southern counties of England, the snowfall ranged from ten to eighteen inches, and, in some instances, the latter amount may have been exceeded. Snow-drifts of four to twelve feet were general over southern England, and, in some cases, they attained a depth of twenty feet. Mr. H. Sowerby Wallis, F. M. S., writing to Symons' Monthly Meteorological Magazine "On the Snow Storm of January, 1881," states:

* * * * *

"The gale was particularly severe on the east coast, but the number of wrecks and casualties on all the coasts was very great; reports from many seaports stating that it was the most severe gale that had been experienced for more than thirty years. Much damage was done to roofs, &c., and a large number of trees were blown down in the eastern counties. * * * In London, an extremely high tide, increased by the gale, overflowed the low-lying districts on the south of the Thames, and caused much distress. * * *

The gale was accompanied by a heavy and steady fall of snow over all but the north of England, which lasted through the 18th, and continued, though rather lighter, till about noon of the 19th. The amount of snow deposited over the whole of the southern portion of the country was very great, and was so drifted by the fierce wind that communication both by road and rail was entirely disorganized, and it was more than a week before the railway and postal arrangements throughout the country recovered their usual regularity and punctuality; the interruption to business was further increased by the large number of telegraph-wires which were broken by the gale or by contraction caused by the extreme cold. * * *

Among careful observers in all parts of the country where the snow fell with its full intensity, it appears to be the general opinion that, to find anything like a parallel case, we must go back to 1836 or to 1814; and it would appear that in most parts of the country the depth in those years was greater, but that the drifts were not so great. As regards the fall in the Isle of Wight and in south Hampshire, it is believed to be altogether unprecedented in recent times. * * * The loss of life in England and Wales entirely due to the snow, was very great, and probably an estimate of one hundred persons would be very near the truth, and the amount of distress occasioned simply by the stoppage of the supplies of food and fuel to country districts from towns is almost incalculable."

In Paris, the snow-storm was also very severe and caused serious delays in the transmission of telegrams, mails, and in other business. Hundreds of market-wagons were abandoned near the suburbs of Paris, in the heavy drifts which had formed, and many of the streets of Paris were completely blocked. At Lille, in northern France, many houses were damaged and large numbers of trees were blown down, and railroad travel was completely suspended. By the 19th, the storm-centre had moved over Belgium and Holland into Germany; during that day snow fell at most stations in Germany, and strong easterly and northeasterly gales prevailed at stations in the northern sections. Snow continued to fall in France and England, and southwesterly to northwesterly winds prevailed in the former country, while in the latter, they shifted to northerly. On the morning of the 20th, the centre of disturbance was in eastern Prussia, whence it moved rapidly eastward, and on the 21st, it was in central Russia; and strong westerly and northwesterly winds prevailed at stations in European Russia. On the 22d, the storm-centre, having moved northeastward, was in the vicinity of the Ural mountains, and to the northeast of Ekaterinburg. On the 23d, the disturbance was in western Siberia, accompanied by rain, snow, and higher temperature; during the day the disturbance disappeared beyond the stations of observation. After the passage of this disturbance, the temperature fell generally throughout central Europe and Russia, and at no time during the prevalence of this storm did it rise above freezing.

XXII.—This disturbance appeared as a slight depression 29.80 (756.9), off the coast of Portugal on the 21st. It moved over the Iberian peninsula, with decreasing pressure at the centre, and on the 22d, was central over the Mediterranean. On the 23d, the region of least pressure was over the Adriatic; during those days, cloudy weather prevailed over Italy, and rain and snow fell at Constantinople, Turkey. By the 24th, the disturbance had moved over the Black sea, and was central near the Caucasus mountains; it then moved eastward over the Caspian sea, and disappeared in western Asia on the 25th.

XXIII.—This depression developed near the Azores on the 23d; it moved eastward, and was central off the coast of Portugal on the 24th, causing cloudy weather and rain over the peninsula. The course then changed to northeasterly, and, on the 25th, the disturbance was central in the Bay of Biscay. Strong easterly gales occurred in the Bay of Biscay, and generally cloudy weather with rain or snow prevailed at the adjacent land stations. On the 26th, the storm-centre was in northern France, where it probably combined with the low-pressure which was spreading over Europe in advance of a deep depression, number ix, then moving toward the British Isles.

XXIV.—This disturbance appeared in northern Scandinavia on the 23d; during the day, it moved in a southeasterly direction towards the White sea, causing rain or snow and rising temperature over northern Europe. On the 24th, the centre of disturbance was near the White sea; on the 25th, it moved to the westward, and strong westerly and southwesterly winds occurred over Scandinavia. The depression remained in northern Scandinavia on the 26th, and disappeared in the Arctic ocean on the following day.

XXV.—This was a secondary depression which developed near the Hebrides on the morning of the 28th, while low-area xxvi, was off the southwest coast of Ireland. It probably united with the central area on the 29th.

XXVI.—This is a continuation of the storm before described as low-area ix. On the 28th, the disturbance was central as a large and deep depression off the coast of Ireland; it moved northward along the Irish coast, and, on the morning of the 29th, was central in the north of Ireland. A decided rise in temperature occurred over the British Isles, and generally heavy rains prevailed over those islands, and over western Europe. During the 30th and 31st, the depression moved slowly northward along the western coast, the pressure slowly increasing at the centre, but at the close of the month, the barometric pressure remained low over the British Isles.

A special feature in the weather of the month was the prevalence of remarkable low temperatures and severe frost in Europe. The subject will be fully noted in the description of chart iv. for January, 1881.

The following descriptions are given of the storms that appeared in eastern Asia:

XXVII.—This was a slight depression which probably developed in northeastern Asia; it moved eastward but did not develop any special energy until after crossing the peninsula of Corea and entering the Japan sea on the 6th. The s. s. "Appin," north of the Oki islands, encountered fresh southerly to south-southeasterly winds on the night of the 5th. On the morning of the 6th, the wind shifted to southwesterly and increased in force. At noon of the same day, the barometer reached its lowest reading, 29.64 (752.8), wind wsw., afterward varying between w. and wnw., and increasing to force 9. The disturbance finally disappeared in the Pacific on the 7th.

XXVIII.—A decrease of pressure occurred over Japan on the 7th and 8th, and on the latter date, the disturbance appeared central in the island of Nippon. On the 9th, it passed off to the Pacific ocean and was immediately followed by violent northwesterly gales over Nippon.

XXIX.—On the 10th, a decided barometric fall occurred over the eastern part of Nippon, the centre of disturbance being probably at some distance from the coast-line. On the following day, the barometer began to rise and the depression passed eastward over the ocean. On the 10th, the s. s. "Belgie," in N. 35° 59', E. 162° 02', reported barometer 30.08 (764.0), wind ssw., force 5, high sw. sea and cloudy weather; on the 11th, the same vessel, in N. 35° 45', E. 158° 29', reported barometer 29.76 (755.9), wind sw., high w. swell and clear weather.

XXX.—On the 17th, the pressure decreased in northern China, the U. S. S. "Ashuelot," at Tientsin, reporting barometer 29.95 (760.7), a fall of .38 inch, weather cloudy. The barometric fall extended southward along the coast of China, and on the 18th, the region of least pressure was over the Japan sea; and cloudy and rainy weather prevailed in Japan. The depression

passed in a northeasterly direction over Nippon, and disappeared in the ocean on the 19th, followed by strong northwesterly gales in the sw. quadrant.

XXXI.—On the 24th, the s. s. "City of Tokio," in N. 35° 33', E. 146° 45', reported barometer 29.46 (748.3), wind wsw., force 8, weather cloudy. The reports of the 25th, 26th, and 27th, from the above-named vessel indicate that the depression passed northeastward over the Pacific as a somewhat severe storm, being accompanied by strong wind of force 6-8.

XXXII.—This disturbance appeared in Nippon on the 28th, attended by cloudy weather and rain. During the 29th and 30th, the pressure remained low over Japan, but on the last day of the month, it began to increase, and the weather cleared.

This month, like the preceding, was marked by the continued presence of barometric minima over Japan, while high-pressures prevailed almost without interruption throughout the month, in China.

TEMPERATURE OF THE AIR.

The distribution of mean temperature, over the United States and Canada, for the month of December, 1882, is exhibited on chart ii., by the dotted isothermal lines. The table of comparative mean temperatures in the lower left-hand corner of the chart, shows the average temperature for the month in the

several districts, as determined from observations taken at the Signal Service stations during the month of December in previous years.

The month of December, 1882, has been colder than the average for December in the Southern, middle, and New England states, and in the regions east of the Missouri valley. It has averaged about 3° below the mean in the Southern states east of the Mississippi river, and over 1° below the average in New England, the middle states, the lower lake region, the Ohio and upper Mississippi valleys. At the Rocky mountain stations and thence westward to the Pacific coast the temperature has been above the mean for the month, the warmest weather being reported from Colorado, Nevada, Wyoming, and on the north Pacific coast, where it averaged from 3° to 5° above the mean for the month. In California and Arizona, the temperature averaged about 1° above the mean. The average temperature on the summits of Mount Washington and Pike's Peak was slightly above the mean for the month.

DEVIATIONS FROM MEAN TEMPERATURE.

The departures exhibited by the reports from the regular Signal Service stations are shown in the table of comparative temperature on the left-hand of chart ii.

The Chief Signal Officer is indebted to voluntary observers

Table of Comparative Minimum Temperatures for the Month of December.

State or Territory.	Minimum for December, 1882, Signal Service.		Lowest since Signal Service stations were opened—3 to 11 years.			Lowest from any other source.			
	Station.	Temp.	Station.	Temp.	Year.	Place.	Temp.	Year.	Length of Record.
Alabama	Montgomery	19	Montgomery	8	1880	Huntsville	7		9 years
Do						Thomas Barracks	10	1875	2 "
Arizona	Prescott	10	Prescott	-18	1879	Fort Canby	-25		12 "
Arkansas	Fort Smith	10	Little Rock	6	1880	Washington, near	-6	1845	27 "
Do						Fort Smith	0		21 "
California	Red Bluff	25	Campo	7	1878	Fort Jones	-17	'55, '57	5 "
Do						Camp Bidwell	-10		15 "
Colorado	Pike's Peak	-15	Pike's Peak	-37	1878	Fort Garland	-30		39 "
Do						Fort Lyon	-30	1876	20 "
Connecticut	New Haven	4	New Haven	-4	1880	Middletown	-18	1860	11 "
Dakota	Tobacco Garden	-35	Femina	-49	1878	Fort Stevenson	-54	1879	7 "
Do			Fort Buford and Stevenson	-46	1879	Fort Totten	-61	1879	7 "
Delaware	Delaware Breakwater	14	Delaware Breakwater	1	1880	Fort Delaware	8		44 "
Do						Dover	8	1876	6 "
Dist. of Columbia	Washington	8	Washington	-13	1880	Washington	-10		48 "
Florida	Pensacola	25	Pensacola	7	1880	Fort Barrancas	16		52 "
Georgia	Atlanta	12	Atlanta	7	1880	McPherson Barracks	-1	1880	7 "
Idaho	Eagle Rock	-25	Lewiston	-16	1879	Fort Hall	-30	1879	10 "
Illinois	Champaign	-14	Chicago	-15	1880	Rock Island Arsenal	-28	1872	14 "
Indiana	Indianapolis	-10	Indianapolis	-15	1876	Wabash	-19	1850	6 "
Indian Territory	Fort Supply	5	Fort Gibson	9	1876	Fort Sill	-11	1872	10 "
Iowa	Des Moines	-17	Dubuque	-19	76, 79, 80	Cresco	-35	1879	8 "
Kansas	Leavenworth	-5	Dodge City	-15	1876	Fort Wallace	-24	1876	8 "
Kentucky	Louisville	4	Louisville	-7	1880	Newport Barracks	-8		28 "
Louisiana	Shreveport	22	Shreveport	-10	1880	Okaloosa	10	1880	3 "
Do						Fort Jessup	14		22 "
Maine	Eastport	5	Eastport	-20	1875	Gardiner	-24		45 "
Maryland	Baltimore	10	Baltimore	-3	1880	Emmitsburg	-19	1880	7 "
Massachusetts	Boston	6	Boston	-11	1875	Billica	-20	1876	8 "
Do						New Bedford	-10	1860	60 "
Michigan	Escanaba	-12	Escanaba	-25	1880	Fort Brady	-41	1872	58 "
Minnesota	Saint Vincent	-30	Saint Vincent	-42	1880	Fort Ripley	-40		14 "
Mississippi	Starkville	13	Vicksburg	12	1880	Fayette	11	1880	8 "
Missouri	Saint Louis	-6	Saint Louis	-15	1880	Holla, near	-23	1870	7 "
Montana	New Chicago	-34	Fort Benton	-39	1880	Camp Baker	-53	1871	9 "
Do						Fort Benton	-54	1880	14 "
Nebraska	Omaha	-15	North Platte	-27	1879	Sydney Barracks	-37	1879	5 "
Do						Glendale	-30	1868	2 "
Nevada	Winnemucca	-4	Winnemucca	-20	1879	Fort Halleck	-22	1879	12 "
New Hampshire	Mount Washington	-25	Mount Washington	-47	1876	Dartmouth College	-29		18 "
Do						Stratford	-24		11 "
New Jersey	Sandy Hook	3	Atlantic City	-7	1880	Linden	-18	1880	6 "
Do									
New Mexico	Santa Fé	-1	Barneget	-7	1880	Fort Union	-28	1855	30 "
New York	Oswego	3	Santa Fé	-13	1879	Madison Barracks	-44	1871	54 "
North Carolina	Charlotte	10	Albany	-17	1875	Lenoir	-16	1880	3 "
Do			Charlotte	-5	1880	Fort Johnson	9		54 "
Ohio	Cleveland	-9	Sandusky	-13	1880	Kenton	-20	1876	3 "
Do						College Hill	-12	1880	65 "
Oregon	Umatilla	6	Portland	3	1879	Eola	-8	1879	7 "
Pennsylvania	Pittsburg	-1.5	Erle	-11	1880	Lewisburg	-23	'67, '67	6 "
Rhode Island	Narragansett Pier	5	Newport	-3	1875	Providence	-12		36 "
South Carolina	Charleston	24	Charleston	13	1880	Aiken	3	1880	7 "
Do						Charleston	20	1861	104 "
Tennessee	Knoxville	5	Knoxville	-5	1880	Clarksville	-4	1880	8 "
Texas	Fort Elliott	1	Fort Elliott	-10	1879	Camp Stockton	-9	1859	15 "
Utah	Salt Lake City	12	Salt Lake City	-10	1879	Fort Crittenden	-22	1859	3 "
Vermont	Burlington	-19	Burlington	-19	1879	Lunenburg	-30	1868	20 "
Virginia	Lynchburg	8	Fort Whipple	-11	1880	Dover	-34	1880	2 "
Do						Fort Monroe	17		56 "
Washington	Colfax	-5	Olympia	-17	1879	Fort Colville	-22	1861	21 "
Do						Fort Townsend	-22	1873	23 "
West Virginia	Morgantown	3	Morgantown	-9	1880	Flemington	-21	1880	3 "
Wisconsin	La Crosse	-20	La Crosse	-26	1879	Fort Howard	-38		31 "
Wyoming	Fort Washakie	-27	Cheyenne	-24	'79-'80	Fort Fetterman	-36	1872	14 "